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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/761,409

01/22/2004

Steven E. Hill

78815(135-1 US)

3319

27975

7590

06/19/2006

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EXAMINER

NGUYEN, TUAN H

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 06/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/761,409

Applicant(s)

HILL ET AL.

Examiner

Tuan H. Nguyen

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 18 April 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-31 and 56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-31 and 56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

The objection, rejections under 35 U.S.C 112, 102/103, and obviousness-type double patenting have been withdrawn in view of the applicant's amendment, terminal disclaimer, and the remarks.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-12, 16-21, 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Background of the invention in view of Kenyon et al..

Background of the invention, pages 1-5 of the instant specification, discloses substantially the claimed doped semiconductor nanocrystal layer except the use of PECVD for forming Er-doped silicon rich silicon oxide layer.

Kenyon et al. in a related article entitled: " Luminescence from erbium-doped silicon nanocrystals in silica: Excitation mechanisms", pages 367-376, particularly on page 368, section II. EXPERIMENT, first paragraph discloses an Erbium-doped silicon nanocrystal layer in silica (group IV silicon dioxide layer) containing 1 at. % erbium on a silicon wafer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used the teachings from Kenyon et al. in the conventional art as disclosed in the Background of the invention since it would form a layer with "both

nanocrystals and erbium are uniformly distributed throughout the film” when formed by PEVCD (page 369, section III. MODEL, last 7 lines, Kenyon et al.). This would inherently includes the Er being dispersed on the surface of the semiconductor nanocrystals.

With respect to the thickness, and concentration ranges as claimed in claims 5-6, 11-12, and 20-21 respectively, they are considered involve routine optimization while has been held to be within the level of ordinary skill in the art as noted in *In Re Aller*, the selection of reaction parameters such as temperature and concentration would have been obvious:

“Normally, it is to be expected that a change in temperature, or in concentration, or in both would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are terms “critical ranges and the applicant has the burden of proving such criticality... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”

*In re Aller* 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948).

Therefore, one of the ordinary skill in the requisite art at the time the invention was made would have used any suitable thickness ranges and the concentration ranges in order to optimize the result.

With respect to claims 9, 10, 18-19, since the group II-IV, III-V, or rare earth element in the form of an oxide or a halogenide is well-known and commercial available, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have used the material for forming the doped layer.

Claims 13-15, 22-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Background of the invention in view of Kenyon et al. as applied to claims 1-12, 16-21, 56 above, and further in view of Zacharias (WO 02/061815, cited by applicant).

The combination of Background of the invention and Kenyon et al. discloses substantially the claimed structure except the superlattice structure as claimed in claims 22-31, and the nanocrystal size as claimed in claims 13-15, and the ITO layer.

Zacharias in a related semiconductor structure as shown in figs. 1-10 and related text, discloses the superlattice structure of the doped semiconductor nanocrystal layers 10 having the thickness of from 1 to 10 nm (see claim 1), and the dielectric layers 18 of oxide or nitride having thickness of relatively thin, in nm range (see pages 13-14); the semiconductor nanocrystal size are from 2-3 nm (see page 20, second and third paragraphs); fig. 9 and related text on page 17 shows the superlattice structure including ITO layer as a current injection layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have constructed the nanocrystal layer disclosed by Background of the invention and Kenyon et al. into a super lattice structure so-called MOS structure as suggested by Zacharias for used in electronic circuit.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

### ***Response to Arguments***

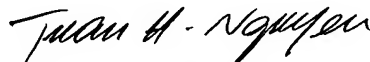
Applicant's arguments filed 4/18/06 have been fully considered but they are not persuasive. Since Kenyon clearly suggests the use of PECVD which is free of ion implantation damage for forming Er-doped silicon nanocrystals in silica (page 367, right-hand column). Particularly on page 368, EXPERIMENT section, first paragraph, Kenyon teaches the formation of thin film using PECVD onto silicon wafers including simultaneous introduction of Si and Er materials. Since the same method is used for forming Er-doped silicon nanocrystals, the Er is inherently distributed evenly on the

surface of the semiconductor nanocrystals (note also on page 369, last 7 lines of MODEL section for the same result).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan H. Nguyen whose telephone number is 571-272-1694. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Tuan H. Nguyen  
Primary Examiner  
Art Unit 2813